Lesson 2 – Background Information

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This is the Background Information lesson.

Upon completion of this lesson, you will be able to:

- Define the term Emissions Inventory.
- Describe the contents of a complete EI.
- Describe the uses of an accurate EI.
- Name the types of pollutants inventoried.
- Describe the six components in creating an inventory.

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Emission Inventories

An emission inventory, or EI, is a current, comprehensive listing, by source, of air pollutant emissions associated with a specific geographic area for a specific time interval.

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Contents of Emission Inventories

A complete emission inventory contains the following information:

- Background information about the need for an inventory,
- A tabular summary of emission estimates by source category,
- A description of the geographic area covered,
- The time interval represented (for example, annual, seasonal, or hourly),
- Population, employment and economic data used to estimate and allocate the emissions, and
- A complete narrative of each source category describing how the data was collected, the sources, and the emission estimation methods and calculations. Also, copies of any questionnaires and the results, and the documentation of assumptions and references should be included. Finally, the sources that are not included in the inventory should be identified.

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Uses for Emission Inventories

Emission inventories are most often developed in response to regulations and are used for a wide variety of purposes. For example, emission inventory data are used to evaluate the status of existing air quality as related to air quality standards and air pollution problems. They are also used to assess the effectiveness of air pollution policy, and to initiate changes as needed. Individual states may have their own specific inventory requirements, while at the federal level, requirements for emission inventories stem mainly from the Clean Air Act.

Some specific uses for an inventory include:

- Meeting Clean Air Act mandates for specific inventories as part of State Implementation Plans (SIPs);

- Tracking progress towards National Ambient Air Quality Standards (NAAQS) attainment and emission reductions;
- Determining compliance with emission regulations and setting the baseline for policy planning;
- Identifying sources and general emission levels, patterns, and trends to develop control strategies and new regulations;
- Predicting pollutant concentrations in the ambient air through the use of dispersion modeling;
- Providing input for human health risk assessment studies;
- Developing residual risk standards;
- Serving as the basis for preparing construction and operating permits; and
- Siting ambient air monitors.

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The Importance of a Complete, Accurate Emissions Inventory

A technically defensible emissions inventory serves as the foundation for sound public policy. Formulation of appropriate control strategies requires a reliable base of quality emissions estimates. If the data used to derive control strategies are flawed, the public policy resulting from the strategy will also be in error. These errors can be costly as the public is exposed to pollutants, the industry becomes subject to control, and the environment is damaged.

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Types of Pollutants Inventoried

This course will discuss 2 categories of pollutants: **Criteria Pollutants** and **Hazardous Air Pollutants** (**HAPs).**

The Clean Air Act directs the EPA to identify and set National Ambient Air Quality Standards or NAAQS for the most common air pollutants. EPA uses these "**criteria pollutants**" as indicators of air quality. These pollutants are: Ozone, Carbon Monoxide, Sulfur Dioxide, Nitrogen Oxides, PM 10 and PM 2.5, and Lead.

Currently, **188 HAPs** or Hazardous Air Pollutants are regulated under Section 112 of the Clean Air Act, and thousands of other potentially toxic substances are being emitted into the environment. Your agency may not have the resources to pursue each of these pollutants and might choose to prioritize the pollutants it needs to inventory. Moreover, some source categories may be of greater importance in your state and of more concern to your agency; therefore, the pollutants emitted from these sources would be of greater concern.

- Elemental **lead** emitted by stationary and mobile sources can cause several types of developmental effects in children including anemia and neurobehavioral and metabolic disorders. Non-ferrous smelters and battery plants are the most significant contributors to atmospheric lead emissions.

- **PM 10 and PM 2.5**
  Air pollutants called particulate matter include dust, dirt, soot, smoke, and liquid droplets. PM originates from a variety of sources, including:
    - Natural sources such as windblown dust and fires;
    - Combustion sources such as motor vehicles, power generation, fuel combustion at industria l facilities, residential fireplaces, and wood stoves. Combustion sources emit particles of ash or incompletely burned materials;
    - Activities such as materials handling, crushing and grinding operations, and travel on unpaved roads; and
    - Interaction of gases (such as ammonia, SO2, NOx, and VOC) with other compounds in the air to form PM.

- **Sulfur dioxide** is a colorless, pungent gas that is a respiratory irritant and like NOx , is a precursor to acid rain. Sulfur dioxide can also interact with other compounds in the air to form PM. Thus, sulfur compounds in the air contribute to visibility impairment in large parts of the country and is especially problematic in national parks. Ambient sulfur dioxide results largely from stationary sources such as coal and oil combustion, steel mills, refineries, pulp and paper mills, and nonferrous smelters.

- **Carbon monoxide** is a colorless, odorless, and poisonous gas produced by incomplete burning of carbon in fuels. More than 75 percent of the CO emissions in the United States are from transportation sources, particularly highway motor vehicles. Other major CO sources are wood-burning stoves, incinerators, and fuel combustion at industrial sources. When CO is inhaled, it enters the bloodstream, and reduces the delivery of oxygen to organs and tissues.

- **Nitrogen oxides** are important precursors to both ozone and acid rain, and as a result may affect not only human health, but also both terrestrial and aquatic ecosystems. Nitrogen oxides can interact with other compounds in the air to form PM.

  Nitrogen oxides form when fuel is burned at high temperatures. The two major emissions sources are motor vehicles and stationary fuel combustion sources such as electric utility and industrial boilers. The major mechanism for the formation of nitrogen dioxide in the atmosphere is the oxidation of the primary air pollutant nitric oxide. When inhaled, nitrogen dioxide can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections.

- **Ozone** , a colorle ss gas, is the major component of smog. Ozone is not emitted directly into the air but is formed through complex chemical reactions between precursor emissions of VOC and NOx in the presence of sunlight. These reactions are accelerated by sunlight and increased temperatures. Peak ozone levels typically occur during the warmer times of the year. Ozone causes health problems because it damages lung tissue, reduces lung function, and sensitizes the lungs to other irritants.

- **Hazardous air pollutants**, also known as toxic air pollutants or air toxics, are those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects.

EPA is required by the Clean Air Act to control 188 hazardous air pollutants. Examples of toxic air pollutants include benzene, which is found in gasoline; perchlorethlyene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper by a number of industries. A complete list of HAPs can be found on the EPA web site.

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Types of Pollutants Inventoried- VOC's

In addition to Criteria Pollutants and HAPs, EPA also regulates emissions of volatile organic compounds or VOCs under the criteria pollutant program. VOCs are ozone precursors—they react with nitrogen oxides in the atmosphere to form ozone. VOCs are emitted from motor vehicles, fuel distribution, chemical manufacturing, and a wide variety of industrial, commercial, and consumer solvent uses.

EPA's current regulatory definition of VOC is located in 40 CFR § 51.100. This definition excludes certain organic compounds considered to be negligibly photochemically reactive.

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Types of Sources Inventoried

Criteria Pollutants and HAPs are produced by 3 basic source types:
Point, Nonpoint and Onroad Mobile.

- **Point sources** are stationary sources of emissions identified individually in the inventory. Point sources may have a minimum reporting threshold; that is, sources emitting above a certain level must be included as point sources in the inventory. Thresholds can be based on level of emissions, potential emissions, type of source, or toxicity of the pollutant. There are often significant differences in the thresholds of emissions for HAPs and Criteria Pollutants.

- For **criteria pollutants**, the emission thresholds vary according to the attainment status and classification of the area in which the source is located, as shown in the chart below.

  Any stationary source emitting pollutants at levels equal to or greater than those shown in the preceding table must be inventoried and reported as point sources. In addition, many states also inventory and report stationary sources **below** these thresholds as point sources.

- Point sources are defined for **HAPs** as sources that emit 10 tons per year of any of the listed toxic air pollutants, or 25 tons per year of a mixture of air toxics. These sources may release air toxics from equipment leaks, when materials are transferred from one location to another, or during discharge through emission stacks or vents

- **Nonpoint sources** are facilities or activities whose individual emissions do not qualify them as point sources. Nonpoint sources represent numerous facilities or activities that individually release small amounts of a given pollutant, but collectively they can release significant amounts of a pollutant. For example, a single dry cleaner within an inventory

area typically will not qualify as a point source, but collectively the emissions from all of the dry cleaning facilities in the inventory area may be significant; thus they must be included in the inventory.

- **Mobile sources** can be divided into onroad vehicles, which include automobiles, light trucks, heavy-duty trucks, buses, motorcycles and nonroad vehicles, such as airplanes, trains, farm and construction equipment, marine engines, and lawn mowers.

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Overview of the EI Process

An Emission Inventory has 6 parts of the process: Planning, Development, QA/QC Procedures, Documentation, Reporting, and Maintenance and Update.

In the following chapters, each step will be discussed in more detail.

- **Planning Activities-** Careful and thorough planning of the inventory procedures will greatly facilitate the process and can prevent the need for costly revisions to the inventory during and after review. Planning includes detailing inventory objectives and general procedures and addresses important issues such as: How do I determine which pollutants to inventory, How do I identify sources of concern, and What data do I report? By considering all of the components of developing an inventory up front, the planning process ensures that proper action can be taken.

- **Inventory Development:** This is the main part of the inventory development process where the data collection and actual estimating and calculating of emissions takes place. Selection of the estimation method and approaches based on the best available data are critical to ensure that the most accurate and representative emissions estimates are included in the inventory.

- **QA/QC Procedures:** A comprehensive Quality Assurance/Quality Control (QA/QC) program is essential to the preparation of a reliable, defensible emissions inventory. Without certain checks along the way, flaws can compound and ruin the entire inventory.

- **Documentation-** Complete and well-organized documentation is necessary to prepare a reliable and technically defensible inventory document. The goal of inventory documentation is to ensure that the final written compilation of the data accurately reflects the inventory effort.

- **Reporting** - The reporting phase in developing an emissions inventory involves the presentation of the data which have been collected, compiled, and analyzed. Proper reporting of the data ensures that the information collected will be used and interpreted correctly.

- **Maintenance and Update -** Compiling an emissions inventory is a continuous process. Maintaining and updating the inventory will ensure its usefulness beyond the year it was first developed.

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Summary

Now that you have completed this lesson, you should be able to:

- Define the term Emissions Inventory.
- Describe the contents of a complete EI.
- Describe the uses of an accurate EI.
- Name the types of pollutants inventoried.
- Describe the six components in creating an inventory.

There are no review questions for this lesson, but concepts discussed here will be important in later lessons.

Continue by selecting a lesson using the Menu, or, just go to the next lesson.